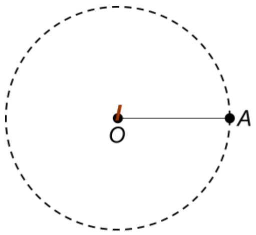
HOW TO SQUARE THE CIRCLE! Please tag your photos and videos #WESTC

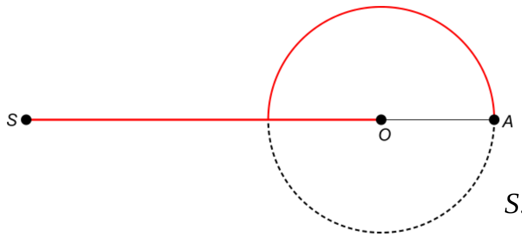
To ‘learn the ropes’ of the lost art of circle squaring, we need nothing but unmarked ropes and pegs. Our construction will be drawn directly onto the ground. We do *not* use compass and straight edge. So, to put a circle upon the ground, we place a fixed peg in the ground with an unmarked rope attached. Then, we pull a free peg at the other end, to straighten the rope as a radius. Then the free peg is swung all the way around the fixed peg, to draw a circle onto our sacred ground. **When a black dot appears in a diagram, hammer a peg into the ground.**

STEP 1



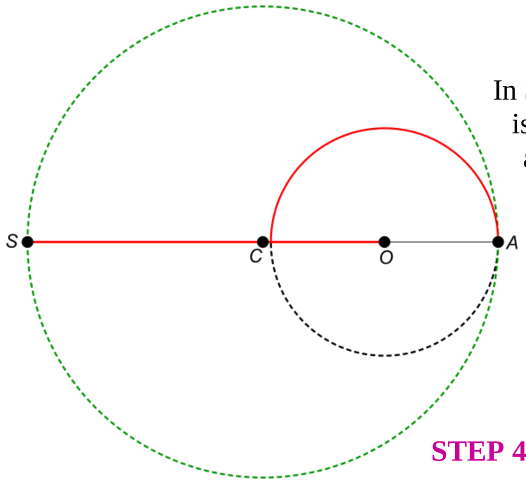
In **STEP 1** a pegged rope is rotated around *O* to draw a circle. The radius, (*r*), is the arbitrary unit of length *OA*.

STEP 2



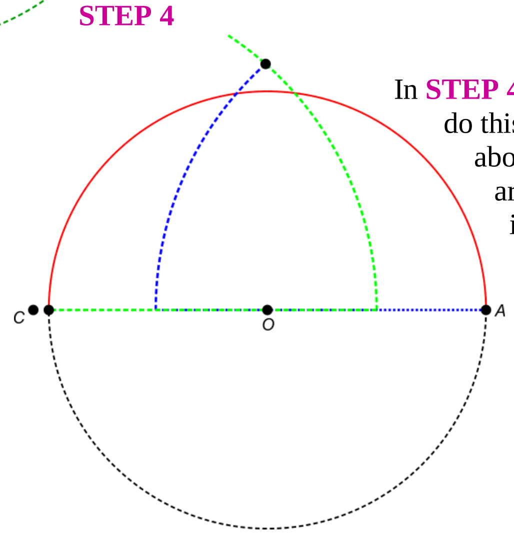
In **STEP 2** a rope (highlighted in red) is laid on the top half of the circumference and cut, (or just pinched and held). This rope is then extended leftward from *O*. We now have pegs at *A*, *O* and *S*.

STEP 3



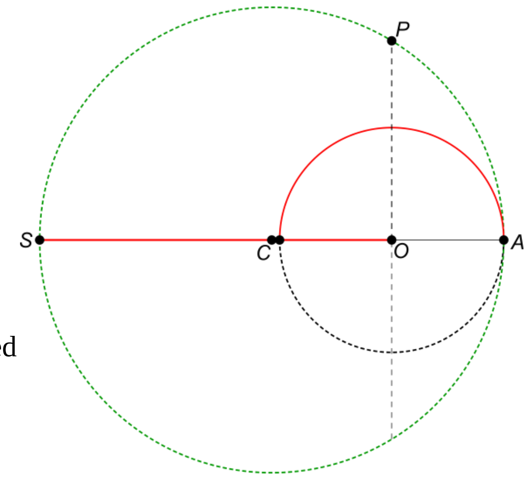
In **STEP 3**, we bisect *SA* at *C* and place a fixed peg at *C*. (A length of rope is easy to bisect!) Then, with a rope pegged at *C*, with length *SC*, we draw a circle around *C*, (shown with green dashes).

STEP 4



In **STEP 4** a perpendicular line is found from *O*. To do this, simply rotate the same length of rope about each end of the diameter of the circle we are squaring. The point where the two arcs intersect gives us a temporary reference point for our perpendicular line from *O*.

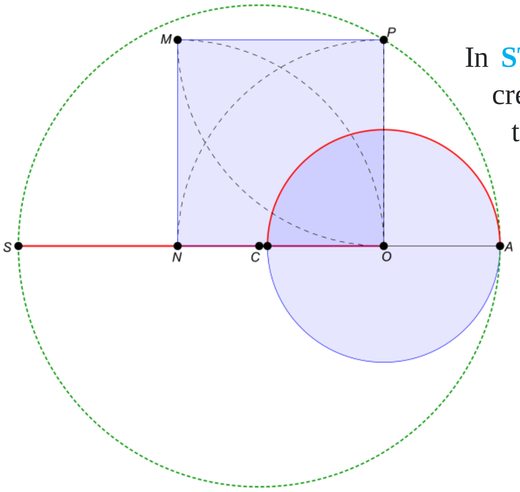
STEP 5



In **STEP 5** a peg point is made at *P*, where the perpendicular from *O* meets the green outer circle. A ‘master rope’ of length *OP* is created, shown as the dashed line from *O* to *P*. This is the first side of our desired square.

Your construction should resemble this (*less the extra quarter circle*).

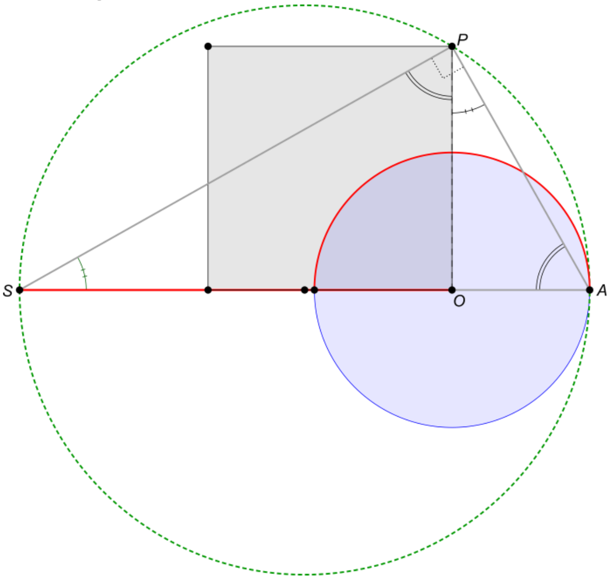
STEP 6



In **STEP 6**, the master rope, *OP*, is swung around *O*, (anti-clockwise), to create the peg point *N*. Then the master rope is swung around peg point N, then peg point *P*, to create intersecting arcs at peg point M. Ropes pegged around *OPMN* then produce a square with the same area as our initial circle. ***Behold! The circle is squared!***

A PROOF, VIA EGYPT AND THALES

The Greek, Thales of Miletus, (624-547 BCE), is mainly known for his theorem that any angle inscribed in a semi-circle must be a right angle. Thales visited Egypt, where he learnt about geo (earth) metry (measurement) before returning to Greece.



Triangles *SOP* and *POA*, with corresponding angles equal, are similar.
$OS : OP :: OP : OA$
Thus, $OS \times OA = OP \times OP$.

The length of *OS* (the semi-circumference) is πr, and *OA* is *r*, with $OP \times OP$ being the area of the square we constructed. Area of square = $OS \times OA = \pi r \times r = \pi r^2$, the area of the circle, whatever its radius may be.

With plain rope, which can be curved in a circular arc and straightened, the circle could have been squared 2600 years ago! So, if it wasn't for the Greek, Oenopides of Chios, who in 425 BCE restricted the tools of geometric construction to straightedge and compass, mathematics would have evolved quite differently.

The author thanks The Aegean Center for the Fine Arts, from the island of Paros, where the circle was squared on Greek sand, in honour of Archimedes, author of *Measurement of a Circle* and *The Sand Reckoner*.

Left to right: A curious local child; Alexia Vlahos, USA; Spiros Mavromatis, Greece; Jane Pack (team leader), USA; Max Wolnak, USA; Maria Xu, China; Annelise Grindheim, Norway; Bea Saenger, USA; Chris Saenger with son Charlie, USA; Cari Saenger, USA; Gail Saunders, USA; Lexi Schmidt, Canada; Iriglenn Leka, Albania; Shreya Shetty, India; and Jun-Pierre Shiozawa, USA. Photograph by John Pack.
[*www.aegeancenter.wordpress.com/2016/04/06/squaring-the-circle-take-two/*](www.aegeancenter.wordpress.com/2016/04/06/squaring-the-circle-take-two/)

References and further reading

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Resources www.bit.ly/squaring-the-circle
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